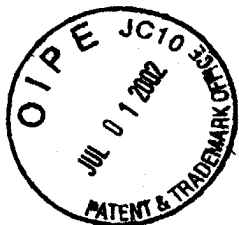


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PATENT

IN THE UNITED STATES. PATENT AND TRADEMARK OFFICE

In re application of

Robert H. Martter et al.

Serial No. 09/650,824

Filed: August 30, 2000

For: CIRCUIT BOARD

Group Art Unit: 2827

Examiner: Quynh-Nhu H. Vu

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APPEAL BRIEF

Sir:

This Brief is filed in triplicate in accordance with 37 CFR 1.192(a) in support of the Notice of Appeal in the above noted application that was mailed on April 22, 2002.

I. REAL PARTY IN INTEREST

The real party in interest or owner of the present application and the technology and inventions embodied therein is The Erie Ceramic Arts Company. An assignment transferring rights from the inventors to The Erie Ceramic Arts Company was recorded

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November 9, 2000 at Reel 011265, Frame 0955, a copy of which is attached hereto for convenience.

II. RELATED APPEALS AND INTERFERENCES

The application is not involved in an interference and there are no related appeals.

III. STATUS OF THE CLAIMS

Application 09/650,824 was originally filed on August 30, 2000 with eighteen (18) claims. A Notice to file missing parts was mailed October 13, 2000 indicating that the basic filing fee and the oath or declaration were missing. Applicants responded on November 6, 2000 by mailing a combined Declaration and Power of Attorney, an Assignment and transmittal cover sheet, the required copy of the Notice to file missing parts, and a check to cover the various fees.

In a first Office Action (mailed August 17, 2001 - Paper No. 4), the Examiner rejected claims 1 - 18. In particular, claims 14 - 15 were rejected under 35 USC 112 as being indefinite and the Examiner suggested that claims 14 - 15 should properly depend from claim 11 rather than claim 1. Claims 1 - 18 were rejected under §103(a)

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as being unpatentable over Mancini, U.S. Pat. 3,654,583. In addition, an objection was made to the drawing Figures.

On November 19, 2001, Applicants mailed an Amendment in which they corrected the drawing Figures as objected to by the Examiner. Applicants also amended claims 14 - 15 to depend from claim 11, as suggested by the Examiner. Also in that Amendment, Applicants provided the Examiner with several reasons why claims 1 - 18 are patentable over Mancini as cited by the Examiner in the prior Office Action.

In a second Office Action (mailed January 30, 2002 - Paper No. 6), the Examiner renewed the rejections of claims 1 - 18 under 35 USC §103(a) and made such rejections final. The Examiner's reasons for rejecting claims 1 - 18 are discussed in detail in the Argument section below.

On April 22, 2002, Applicants filed a Notice of Appeal from the decision of the Examiner mailed January 30, 2002 rejecting claims 1 - 18. Accordingly, claims 1 - 18 are currently pending in the application, and all such claims are pending on appeal. The pending claims, in their current form, are set forth in Appendix A, which is attached hereto for the convenience of the Board.

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IV. STATUS OF AMENDMENTS

No amendments were filed in the application subsequent to the mailing of the final rejection (Office Action mailed January 30, 2002 - Paper No. 6).

V. SUMMARY OF INVENTION

With reference to Fig. 1B and as stated on page 1, lines 2-7 of the application, the present invention relates to an electrical circuit device 10 comprising a porcelain enamel coated metal substrate 11. In particular, the invention relates to the formation of a high strength solder connection 52 between a flexible conductor 50, for example, a wire or the lead of an electronic component, and a printed circuit board formed of a porcelain enamel coated metal substrate 11. The circuit device 10, comprising a porcelain enamel coated metal substrate 11 according to the invention, has a conductive circuit 16 formed thereon and an external electrical conductor 50 attached thereto and includes a metal base 11 that is coated with porcelain enamel 14. The base 11 has an aperture 17. A fastener 20 is mounted on the aperture 17. The electrical conductor 50 is soldered to the fastener 20.

As noted on page 2, lines 15 - 22 of the application, the invention also provides a method for connecting an external electrical conductor 50 to a porcelain enameled metal substrate 11 electrical circuit device 10. The method includes providing a

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porcelain enameled metal substrate 11 having an aperture 17 formed therein. A hollow mechanical fastener 20 is inserted through the aperture 17. The fastener 20 is mechanically fastened to the metal substrate 11 so as to form an eyelet 20. The external electrical conductor is inserted into the eyelet 20. Solder 52 is applied to the external electrical conductor 50 and the eyelet 20.

The present invention solves several problems in prior art electrical connections on printed circuit boards. The addition of the eyelet to the soldered joint connection mechanically reinforces the solder joint and provides improved mechanical strength to the joint.

VI. ISSUE

Whether claims 1 - 18 stand properly rejected under 35 USC §103(a) as being unpatentable over Mancini, U.S. Pat. No. 3,654,583.

VII. GROUPING OF CLAIMS 1 - 18

For the reasons set forth below, applicant respectfully submits that the claims should not be grouped together and they are thus separately patentable.

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VIII. ALLOWABILITY OF CLAIMS 1 - 18

For the reasons set forth below, Applicants respectfully submit that the claims 1 - 18 are patentable over Mancini and are thus separately allowable for the reasons stated below.

IX. ARGUMENT

For the reasons set forth below, Applicants respectfully submits that claims 1 - 18 are patentable over the cited references.

A. CLAIMS 1 - 18 ARE NOT OBVIOUS

1. Independent Claim 1 Is Not Obvious Based on Mancini and Applicants' Admitted Prior Art.

a. The Mancini reference.

Mancini relates to an improved solder type circuit board eyelet that is secured in a hole formed through the thickness of a circuit board. The eyelet includes a cylindrical body portion and an annular funnel flange on each end of the body. Flat pad contact surfaces are formed in the flanges so that when the eyelet is staked to the circuit board, the surfaces lie flush against printed circuit pads on the circuit board. A

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cylindrical insulating sheath may be fitted around the eyelet body in order to insulate the eyelet from a metal core in the circuit board.

With reference to Fig. 2, Mancini discloses a metal substrate 44 with an insulation coating 42 and an eyelet 10. The composition of the insulation coating 42 is not disclosed in the text of the specification. But, the composition is clearly shown as a section of synthetic resin or plastic by virtue of the cross-hatching in compliance with 37 CFR 1.84(n) and MPEP § 608.02. Accordingly, Mancini discloses only the use of a plastic insulating layer 42 over the metal substrate 44 in conjunction with the eyelet 10.

b. Applicants' Admitted Prior Art.

The Examiner refers to the Background of the Invention on page 1, lines 10-15 of the application to state that "...it is well known in the art to use to [sic] metal substrate coated with a porcelain-enameled material..." But, the Background of the Invention discloses only that there are "[m]any modern printed circuit cards compris[ing] substrates formed of porcelain enameled metal" and that "[t]he resulting coated metal substrate can be used for circuit boards, thermal sinks, thermal barriers, RF shielding, magnetic flux conduction, mechanical attachments and other related applications." Accordingly, the Background of the Invention discloses only that porcelain enameled metal substrates are known and used for, e.g., circuit boards.

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c. Summary of Independent claim 1.

Claim 1 of the present application is drawn to a method for connecting an external electrical conductor to a porcelain enameled metal substrate electrical circuit device. A porcelain enameled metal substrate having an aperture formed therein is provided. A hollow mechanical fastener is inserted through the aperture. The fastener is mechanically fastened to the metal substrate so as to form an eyelet. The external electrical conductor is inserted into the eyelet. Solder is applied to the external electrical conductor and the eyelet.

d. Independent claim 1 is not obvious based on Mancini and Applicants' Admitted Prior Art.

The standard for an obviousness rejection is defined by 35 USC § 103(a). Section 103(a) precludes the grant of a patent "if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person of ordinary skill in the art."

The Examiner bears the burden of establishing a *prima facie* case of obviousness. *In re Rijckaert*, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). If the

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references cited by the Examiner fail to establish a *prima facie* case of obviousness, the rejection is improper and should be overturned. See *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988).

In order to establish a *prima facie* case of obviousness, three criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. *Id.* Second, there must be a reasonable expectation of success. *In re Merck & Co., Inc.*, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Finally, the prior art reference must teach or suggest all the claim limitations. *In re Rokya*, 180 U.S.P.Q. 580 (CCPA 1974).

With reference to the first two of the three criteria, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on the Applicant's disclosure. *In re Vaeck*, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). An obviousness determination must be based on objective evidence of record. *In re Sang Su Lee*, 277 F.3d 1338, 1342 (Fed. Cir. 2002). This requirement cannot be dispensed with. See, e.g., *Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 229 F.3d 1120, 1124-25 (Fed. Cir. 2000) (a showing of a suggestion, teaching, or motivation to combine the prior art references is an 'essential component of an obviousness holding') (quoting *C.R. Bard, Inc., v. M3*

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Systems, Inc., 157 F.3d 1340, 1352 (Fed. Cir. 1998). The burden of showing obviousness of the combination is satisfied "only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. *In re Fritch*, 972 F.2d 1260, 1265 (Fed. Cir. 1992).

The teaching of references can be combined only if there is some suggestion or incentive to do so. Particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed. *In re Kotzab*, 217 F.3d 1365, 1371 (Fed. Cir. 2000).

There is no suggestion or motivation in either Mancini or Applicants' admitted prior art to combine the references. It is therefore improper to combine the references. *In re Fine*, 837 F.2d 1071, 1075 (Fed. Cir. 1988) (teachings of references can be combined *only* if there is some suggestion or incentive to do so.) (emphasis in original) (quoting *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577 (Fed. Cir. 1984)).

There is no reasonable expectation of success to support combining the references. Porcelain enamel has considerably different properties compared to the plastic insulative layers that have been employed in connection with fasteners in the

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prior art. For example, porcelain enamel is generally less flexible than comparable plastics. Thus, it would be unexpected that there would be no cracking of the porcelain and degradation of the solder joint integrity when a mechanical fastener is used in conjunction with the porcelain enamel coated metal substrate.

Compare the language of Mancini at column 3, line 35, "The term "circuit board" is intended to include other circuit substrates, including flexible panels." Thus, in addition to the flexible plastic coated aluminum circuit board disclosed, Mancini also contemplates flexible panels. Applicants submit that Mancini which teaches a "flexible panel" teaches away from the use of a rigid material such as porcelain, and thus Mancini is not properly combinable with Applicants' admitted prior art.

Applicants respectfully submit that (1) there is no suggestion or motivation to combine the various references so as to render obvious the Applicants' invention as claimed in claim 1, (2) there is no reasonable expectation of success sufficient to support the combination of the references, (3) the Examiner clearly failed to establish a *prima facie* case of obviousness with respect to claim 1 because there is neither a motivation to combine or a reasonable expectation of success, and (4) the invention defined by claim 1 is not obvious. Accordingly, it is submitted that claim 1 is allowable over the cited prior art.

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2. Dependent Claims 2 - 10 Are Not Obvious Based on Mancini or Applicants' Admitted Prior Art.

It is axiomatic that if an independent claim is nonobvious under 35 USC §103(a), then any claim depending therefrom must also be nonobvious. See *In re Fine* at 1596. For the reasons set forth above, Applicants respectfully submit that independent claim 1 is nonobvious under 35 USC §103(a). Accordingly, Applicants respectfully submit that claims 2 - 10, which depend from claim 1, must also be nonobvious.

Notwithstanding the foregoing, Applicants submit that there are additional independent reasons why claims 2 - 10 are nonobvious in view of the cited references.

Claim 2 depends from claim 1 and states that "the external electrical conductor is a wire." The Examiner states that "the external electrical conductor (60) is a wire." However, Mancini only describes the structure indicated by reference numeral 60 as a lead, for example at column 2, line 47, and not as a wire. Thus, claim 2 is patentable over Mancini, alone or in combination with Applicants admitted prior art.

Claim 3 depends from claim 2. Claim 3 states that "the eyelet is comprised of brass." The Examiner admits that Mancini does not disclose the use of a brass eyelet.

However, the Examiner makes two arguments, the first is that "it is well known in the art to use the eyelet made of brass for cost of saving and more retaining the eyelet in

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the lead and base substrate." The second argument is that it is within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

With regard to the Examiner's first argument, no reference was shown to indicate that cost savings actually accrue from the use of brass eyelets. Nor is there a reference indicating that brass better retains a lead in an eyelet. These unsubstantiated assertions do not provide the required objective evidence of record necessary to support a finding of obviousness. Thus, claim 3 is patentable over this first argument.

With regard to the Examiner's second argument, as stated above, particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed. *In re Kotzab*, 217 F.3d at 1371. No such showing was made as to the reason for selecting brass for a fastener, and more particularly, selecting a brass fastener for use with a porcelain enamel coated metal substrate. A reference disclosing a brass fastener and a motivation to combine that reference with the prior art of record must be shown. In addition, there must be a reasonable expectation of success in combining the references to achieve the invention as defined in claim 3. Thus, claim 3 is patentable over this second argument.

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Claim 4 depends from claim 3. Claim 4 states that "the eyelet is electrically connected to a conductor on at least one surface of the electrical circuit device." As described above, the electrical circuit device is a porcelain enamel coated metal substrate. Mancini does not disclose such a surface or such a circuit device. Thus, claim 4 is patentable over Mancini, alone or in combination with Applicants admitted prior art.

Claim 5 depends from claim 4. Claim 5 states "the eyelet is soldered to at least one surface of the electrical circuit device." The electrical circuit device includes a porcelain enamel coated metal substrate. Mancini does not disclose such a surface or such a circuit device. Thus, claim 5 is patentable over Mancini, alone or in combination with Applicants admitted prior art.

Claim 6 depends from claim 1. Claim 6 states that "the external electrical conductor is a lead to an electronic component." The Examiner states that the lead (60) in Mancini "is a lead to an electronic component." Mancini, however, does not disclose what, if anything, the lead is for, rather, Mancini just discloses a lead (60) (column 2, line 47). Thus, claim 6 is patentable over Mancini, alone or in combination with Applicants admitted prior art.

Claim 7 depends from claim 6, which depends from claim 1. Claim 7 states that "the eyelet is comprised of brass." The Examiner admits that Mancini does not

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disclose the use of a brass eyelet. However, the Examiner makes two arguments, the first is that "it is well known in the art to use the eyelet made of brass for cost of saving and more retaining the eyelet in the lead and base substrate." The second argument is that it is within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

As noted above, no reference was shown to indicate that cost savings actually accrue from the use of brass eyelets. Nor is there a reference indicating that brass better retains a lead in an eyelet. These unsubstantiated assertions do not provide the required objective evidence of record necessary to support a finding of obviousness. Thus, claim 7 is patentable over this first argument. In addition, particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed. *In re Kotzab*, 217 F.3d at 1371. No such showing was made as to the reason for selecting brass for a fastener, and more particularly, selecting a brass fastener for use with a porcelain enamel coated metal substrate. A reference disclosing a brass fastener and a motivation to combine that reference with the prior art of record must be shown. In addition, there must be a reasonable expectation of success in combining the references to achieve the invention as defined in claim 7.

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Thus, claim 7 is patentable over Mancini, alone or in combination with Applicant's admitted prior art.

Claim 8 depends from claim 7, which depends from claim 1. Claim 8 states that "the eyelet is electrically connected to a conductor on at least one surface of the electrical circuit device." As described above, the electrical circuit device is a porcelain enamel coated metal substrate. Mancini does not disclose such a surface or such a circuit device. Thus, claim 8 is patentable over Mancini, alone or in combination with Applicants admitted prior art.

Claim 9 depends from claim 8, which depends from claim 7. Claim 9 states "the eyelet is soldered to at least one surface of the electrical circuit device." The electrical circuit device is a porcelain enamel coated metal substrate. Mancini does not disclose such a surface or such a circuit device. Thus, claim 9 is patentable over Mancini, alone or in combination with Applicants admitted prior art.

Claim 10 depends from claim 1. Claim 10 states the step "of mechanically fastening the fastener to the metal substrate comprises crimping the fastener to the metal substrate." The Examiner states that Mancini discloses crimping. But, Mancini does not disclose crimping, rather Mancini discloses securing the eyelet to the circuit board at column 2, line 31 and specifically states that "[t]he eyelet is then physically secured to the circuit board by deforming end 22 into the flange 50..." and that the

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eyelet is "staked to the circuit board as illustrated in Fig. 2..." (column 2, line 38). Mancini does not indicate that either "staking" or "deforming" are crimping or an equivalent of crimping. Accordingly, claim 10 is patentable over Mancini, alone or in combination with Applicants admitted prior art.

3. Independent Claim 11 Is Not Obvious Based on Mancini and Applicants' Admitted Prior Art.

a. Summary of Independent claim 11

Claim 11 of the present application is drawn to a circuit device of a porcelain enameled metal substrate. The substrate has a conductive circuit formed thereon and an external electrical conductor attached thereto. The substrate includes a metal base coated with porcelain enamel and an aperture formed in the base. The aperture has mounted thereon a fastener. The electrical conductor is soldered to the fastener.

b. Independent claim 11 is not obvious based on Mancini and Applicants' Admitted Prior Art.

Applicants respectfully submit that for at least the reasons as described for claim 1, there is no basis for combining the various references so as to render Applicants' invention as claimed in claim 11 obvious. The Examiner argues that claim

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11 is obvious over Mancini and further in view of Applicants admitted prior art in the Background of the Invention.

Specifically with reference to claim 11, the Examiner did not show a suggestion or motivation in the references to combine the teachings to produce the invention defined in claim 11. Neither did the Examiner show that there was a reasonable chance of success in combining the teachings to produce the invention defined in claim 11. Thus, the Examiner clearly failed to establish a *prima facie* case of obviousness with respect to claim 11. Accordingly, it is submitted that claim 11 is allowable over the cited prior art.

4. Dependent Claims 12 - 17 Are Not Obvious Based on Mancini and Applicants' Admitted Prior Art.

As noted above, if an independent claim is nonobvious under 35 USC §103(a), then any claim depending therefrom must also be nonobvious. See *In re Fine, supra*. For the reasons set forth above, Independent claim 11 is nonobvious under 35 USC §103(a). Accordingly, Applicants respectfully submit that claims 12 - 17, which depend from claim 11, must also be nonobvious.

Notwithstanding the foregoing, Applicants submit that there are additional independent reasons why claims 12 - 17 are nonobvious in view of the cited

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references. Claim 12 depends from claim 11. Claim 12 states the "external electrical conductor comprises a length of flexible copper wire." The Examiner refers to the lead (60) in Mancini. But, Mancini only describes the structure indicated by reference numeral 60 as a lead, for example at column 2, line 47, and not as a wire nor does it teach that the lead is a flexible wire.

Claim 13 depends from claim 11. Claim 13 states the "fastener is mechanically crimped to [the] metal substrate." Mancini discloses securing the eyelet to the circuit board at column 1, line 75, and at column 2, line 31 discloses that "[t]he eyelet is then physically secured to the circuit board by deforming end 22 into the flange 50..." and that the eyelet is "staked to the circuit board as illustrated in Fig. 2..." (column 2, line 38). But, Mancini does not indicate that either "staking" or "deforming" are crimping or an equivalent of crimping. Accordingly, claim 13 is patentable over Mancini, alone or in combination with Applicants admitted prior art.

Claim 14 depends from claim 11. Claim 14 states the "fastener is electrically insulated from the metal substrate." At page 5, line 9 of the Application, it discloses that the porcelain enamel coating 15 can extend into the aperture 17 so as to electrically insulate the fastener from the base 11. The Examiner states that the insulating sheath (24) is between the fastener and the metal substrate (44). Mancini does not, however, disclose "a porcelain enameled metal substrate" as defined in

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claim 14. Neither does Mancini teach or suggest extending an insulative coating of the major surfaces through an aperture so as to insulate a fastener in the aperture from a metal substrate.

With regard to the insulating sheath (24), Mancini discloses a high melt temperature plastic (column 1, lines 71 - 72) such as TEFLON or KAPTON. This sheath (24) is different than the sleeve 25 according to the invention. Neither TEFLON or KAPTON are silicone-based or considered elastomeric as disclosed in the application at page 5, line 13. Thus, claim 14 is patentable over Mancini, alone or in combination with Applicants admitted prior art.

Claim 15 depends from claim 11. Claim 15 states the "metal substrate comprises low carbon steel." Mancini does not disclose low carbon steel, rather Mancini discloses the use of aluminum. However, the Examiner argues that it is within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice, citing to *In re Leshin* at 416.

As stated above, particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed. *In re Kotzab*, 217 F.3d at 1371. No such showing was made as to the reason for selecting low carbon steel as the

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metal substrate, and more particularly, selecting a low carbon steel for use as a porcelain enamel coated metal substrate. Thus, claim 15 is patentable over Mancini, alone or in combination with Applicants admitted prior art.

Claim 16 depends from claim 11. Claim 16 states that the "fastener is electrically connected to [the] conductive circuit." The Examiner states that the fastener is electrically connected to the conductive circuit (46). Mancini does not, however, disclose "a porcelain enameled metal substrate." Thus, claim 16 is patentable over Mancini, alone or in combination with Applicants admitted prior art.

Claim 17 depends from claim 11. Claim 17 states that the "porcelain enamel metal substrate includes two major surfaces, and [the] conductive circuit is formed on both of [the] surfaces." The Examiner states that "the dielectric (24, 42) or porcelain enamel metal substrate includes two major surfaces, and the conductive circuit (46) is formed on both the major surfaces." Mancini does not, however, disclose "a porcelain enameled metal substrate." Thus, claim 17 is patentable over Mancini, alone or in combination with Applicants' admitted prior art.

5. Independent Claim 18 Is Not Obvious Based on Mancini and Applicants' Admitted Prior Art.

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a. Summary of Independent claim 18

Claim 18 of the present application is drawn to a circuit device comprised of a porcelain enameled metal substrate. The substrate has a conductive circuit formed on each side of the substrate. The substrate includes a metal base coated with porcelain enamel and an aperture formed in the base. The aperture has a fastener mounted therein. The fastener electrically connecting the conductive circuits formed on each side of the substrate.

b. Independent claim 18 is not obvious based on Mancini and Applicants' Admitted Prior Art.

Applicants respectfully submit that for at least reasons as described for claims 1 and 11, there is no basis for combining the various references so as to render Applicants' invention as claimed in claim 18 obvious.

The Examiner argues that claim 18 is obvious over Mancini and further in view of Applicants admitted prior art in the Background of the Invention. Specifically with reference to claim 18, the Examiner did not show a suggestion or motivation in the references to combine the teachings to produce the invention defined in claim 18. Neither did the Examiner show that there was a reasonable chance of success in combining the teachings to produce the invention defined in claim 18. Thus, the

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Examiner clearly failed to establish a *prima facie* case of obviousness with respect to claim 18. Accordingly, it is submitted that claim 18 is allowable over the cited prior art.

X. CONCLUSION

In light of the foregoing, it is respectfully submitted that claims 1 - 18 are allowable over the prior references of record, and a ruling from the Board to that effect is therefore respectfully requested.

Respectfully submitted,

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Appendix A

1. A method for connecting an external electrical conductor to a porcelain enameled metal substrate electrical circuit device comprising:

(a) providing a porcelain enameled metal substrate having an aperture formed therein;

(b) inserting a hollow mechanical fastener through the aperture;

(c) mechanically fastening the fastener to the metal substrate so as to form an eyelet;

(d) inserting the external electrical conductor into the eyelet;

(e) applying solder to the external electrical conductor and the eyelet.

2. The method in claim 1 wherein the external electrical conductor is a wire.

3. The method in claim 2 wherein the eyelet is comprised of brass.

4. The method in claim 3 wherein the eyelet is electrically connected to a conductor on at least one surface of the electrical circuit device.

5. The method in claim 4 wherein the eyelet is soldered to at least one surface of the electrical circuit device.

6. The method in claim 1 wherein the external electrical conductor is a lead to an electronic component.

7. The method in claim 6 wherein the eyelet is comprised of brass.

8. The method in claim 7 wherein the eyelet is electrically connected to a conductor on at least one surface of the electrical circuit device.

9. The method in claim 8 wherein the eyelet is soldered to at least one surface of the electrical circuit device.

10. A method as set forth in claim 1 wherein said step (c) of mechanically fastening the fastener to the metal substrate comprises crimping the fastener to the metal substrate.

11. A circuit device comprised of a porcelain enameled metal substrate having a conductive circuit formed thereon and an external electrical conductor attached thereto

comprising a metal based coated with porcelain enamel and an aperture formed in said base, said aperture having mounted thereon a fastener, said electrical conductor being soldered to said fastener.

12. A circuit device as set forth in claim 11 wherein said external electrical conductor comprises a length of flexible copper wire.

13. A circuit device as set forth in claim 11 wherein said fastener is mechanically crimped to said metal substrate.

14. A circuit device as set forth in claim 11 wherein said fastener is electrically insulated from said metal substrate.

15. A circuit device as set forth in claim 11 wherein said metal substrate comprises low carbon steel.

16. A circuit device as set forth in claim 11 wherein said fastener is electrically connected to said conductive circuit.

17. A circuit device as set forth in claim 11 wherein said porcelain enamel metal substrate includes two major surfaces, and said conductive circuit is formed on both of said major surfaces.

18. A circuit device comprised of a porcelain enameled metal substrate having a conductive circuit formed on each side of said substrate comprising a metal base coated with porcelain enamel and an aperture formed in said base, said aperture having mounted therein a fastener, said fastener electrically connecting said conductive circuits formed on each side of said substrate.